

**Full Length Research Paper****An Overview of certain Physico-chemical Parameters of Paper Mill Effluent****Dhanushree M S and Hina Kousar***Department of Post Graduate Studies and Research in Environmental Science, Kuvempu University, Shankaraghatta, Shimoga, Karnataka, India.***Corresponding author: Hina Kousar.***Abstract**

This paper deals with the physico-chemical properties of effluent collected from Mysore Paper Mills Ltd, Bhadravathi, Shimoga-Karnataka. The effluent was collected from the inlet of effluent treatment plant and subjected for analysis of various physico-chemical parameters such as pH, biological oxygen demand (BOD), chemical oxygen demand (COD), total dissolved solids (TDS) and total solids (TS). Results show that pH- 7.39, TDS-578 mg/l and TS- 908 mg/l are within the permissible limits, whereas BOD- 108 mg/l and COD- 495 mg/l do not meet the permissible standards.

Key words: Physico-chemical, BOD, COD, TDS, TS**Introduction**

Water is one of the essential requirements for life. The water in hydrosphere is distributed to an extent of about 97.5% as marine water and 2.7% as freshwater and as polar ice caps. Our water resources are depleting at an alarming rate due to increasing population. Industries play a major role in water pollution, Pulp and paper industry is considered as one of the most polluting industry (Bahar K Ince *et al.*). Pulp and paper manufacturing is one of the oldest and largest industry in India with an installed capacity of about three million metric tons per annum finished product (Piyush Malaviya & Rathore V.S, 2007). The most significant sources of pollution among various processing stages are wood preparation, pulping, pulp washing, screening and bleaching (Akan JC, 2008).

Among various processes, chemical pulping generates high amount of waste water. The waste water generally contains high concentration of color, Biological oxygen demand (BOD) and Chemical oxygen demand (COD) due to the presence of lignin and its derivatives from the raw cellulosic materials, chlorinated compounds, suspended solids, fatty acids, tannins, resin acids, sulfur and its compounds etc., (Kesalkar *et al.*, 2012). These organic and inorganic constituents of effluent are responsible for the characteristic dark brown color and toxicity of effluent (Chopra A. K & Pushendra Pual Singh, 2012). Waste water treatment and disposal is one of the major problem of pulp and paper industry (Bahar K Ince *et al.*). Thus, it is obligatory to treat the effluent prior to its discharge into receiving water bodies. The present study shows an overview of characteristics of waste water from pulping process and the data would be useful in developing innovative effluent treatment techniques for pulp and paper industries.

Materials and Methods**Study area**

Bhadravathi town in the state of Karnataka is famous for housing two industries i.e. Mysore paper Mills and Visveswariah Iron and Steel Ltd. The town was considered as the third most polluted town in India by CPCB in 2009. The industry is situated 27 KM away from Kuvempu University.

Collection of samples

The samples were collected from inlet of the effluent treatment plant of Mysore Paper Mills, Bhadravathi, Shimoga, Karnataka state. It was collected in plastic cans using grab sampling technique (Kesalkar *et al.*, 2012) and stored at 4°C prior to further treatment.

Physico-chemical analysis of waste water

Collected samples from the paper industry were brought to the laboratory of Department of PG Studies and Research in Environmental Science, Kuvempu University for the analysis of certain parameters – pH, Biological oxygen demand, Chemical oxygen demand, Total dissolved solids and Total solids. IS and APHA standard methods were followed for physico-chemical analysis of different parameters listed below.

Table 1. Methods for Physico-chemical analysis of different parameters

Sl No	Physico-Chemical Parameters	Technique used
1	pH	pH Meter - IS-3025(P1)
2	Biological oxygen demand	5 days incubation at 20 ⁰ C. IS-3025(P 44)
3	Chemical oxygen demand	Closed Reflux Method. APHA 2009
4	Total dissolved solids	Gravimetric method. IS-3025(P16)
5	Total solids	Gravimetric method. IS-3025(P15)

Results

The characteristic of paper mill effluent and IS permissible limits for listed parameters are given below (Medhi *et al.*, 2011).

Sl.No	Physico – Chemical Parameters	Effluent	IS (Permissible limits) for paper mill effluent
1	pH@ 24 ⁰ C	7.39	-
2	Biological Oxygen Demand (mg/l)	108	100
3	Chemical Oxygen Demand (mg/l)	495	350
4	Total Dissolved Solids (mg/l)	578	1000
5	Total Solids (mg/l)	908	1200

Discussion

pH of the sample was found to be 7.39 which is slightly alkaline. The pH of paper industry effluent was 6-9 as reported by Surumbar Kuzhali *et al.*, 2012. The discharge of waste water into water bodies may cause a drop or increase in their pH due to the size and activities of microbial population.

Biological oxygen demand (BOD) is the amount of oxygen required for microbial degradation of organic matter. BOD is a commonly used parameter for the determination of pollution load. The BOD of the effluent was found to be 108 mg/l. IS prescribed limit for BOD of effluent before discharge is 100 mg/l. High BOD levels are indications of the pollution strength of the waste waters. The high BOD and low oxygen content of effluent will affect survival of gill breathing animals of the receiving water body (Saravana Sundaram *et al.*, 2014). Effluent was rich in organic constituents and for the degradation more oxygen is required. Hence, BOD of effluent is high.

Chemical oxygen demand (COD) is the amount of oxygen required to breakdown both organic and inorganic matter. COD is also one of the parameters which indicate the pollution load of effluent. The COD of the sample was 495 mg/l. The prescribed limit for COD in effluent is 350 mg/l. The value obtained is more than permissible limits which indicates toxic state of waste water along with the presence of biologically resistant organic substances (Anju Bhatnagar, 2015). Due to high chemical concentration the effluent has more COD.

Total dissolved solids (TDS) is the measure of inorganic salts, organic matter and other dissolved materials in water (Pooja Tripathi *et al.*, 2013). The TDS of effluent obtained is 578 mg/l which is less than the prescribed standards of IS.

Total solids (TS) are the solids suspended and can be settled in water having size of 0.002 cm or 2 microns. TS of effluent is about 908 mg/l and it is within the permissible limits prescribed by IS.

Conclusion

- ✓ pH is within the acceptable limit as prescribed according to Indian Standards (IS).
- ✓ Chemical parameters of effluent such as TDS and TS are within the acceptable limits where as BOD and COD are above the permissible limit.

Recommendation

The industry has to implement effective treatment technologies for effluent treatment and to solve the problem of pollution.

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